GARDEN AND FOREST.

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Botany in the Agricultural Colleges.

SOME time ago Professor Bailey, in a suggestive contribution to *Science*, made a plea for a broader botany. We quoted largely from the article at the time of its publication and will only repeat that the fact complained of was the restriction of botanical science to the study of wild plants. This was natural in earlier days, when there was little attempt to apply science to cultivation, but since the theory of evolution has come to be accepted, a new purpose has been given to the study of all natural objects, and cultivated plants especially have gained a fascinating interest because they furnish such conspicuous examples of variation and heredity. The great mass of material which the multiplied species of cultivated plants afford can be made to illustrate the accumulative effect of modified environment and selection under the influence of human care as wild plants cannot possibly do. They can show within a brief period as much progression in definite lines as their wild prototypes could show in ages. This makes the garden one of the best places in which evolution can be studied. But the point which it is proposed here to insist upon is, that more and more it should be the endeavor of those interested in agriculture and horticulture to bring into practical use the facts and laws which science discloses, and make them actually helpful in the cultivation of plants. The study of botany as pure science, the investigation of the laws of plant physiology and variation under different conditions, can have abundant application in improving the quality and changing the character of economic plants as well as in developing new and better methods of cultivation. This means that not only should increased attention be given to the study of fungi and bacteria and other special branches of the science, but that more attention should be given to investigations and experiments to show how all the general truths of the science can be applied to the improvement of agricultural and horticultural practice.

There is encouragement in the fact that the attention paid to botanical science in this country has largely increased in recent years. In an address delivered by Dr. Beal at the laying of the corner-stone of the new laboratory in the Agricultural College of Michigan he stated that in 1859 when he took his first degree at the University of Michigan there was but one institution of learning in the United States where a man was employed and paid for devoting his entire time to the science of botany. That man was Dr. Asa Gray, Professor of Botany at Harvard University, and at that time only eight weeks of daily work were required of undergraduate students, and they had the opportunity of electing about three weeks more. A very few resident graduates, from one to three at a time, pursued the science further. In a few other universities and colleges, botany filled a small niche in the general course of study, the same man usually teaching botany, zoölogy and geology in the course, and often, too, giving instructions in other branches of learning.

The increased interest and attention which the study of botany has attracted and which is seen in the numerous state and national gatherings of men of science where a growing number of subjects in this field are discussed in a broad and practical way by able men and women, is largely due to the work in the agricultural colleges and in the national Department of Agriculture. The work of practical botanists can be seen in numerous journals and transactions of these societies, in many books and bulletins. The place which the science of botany ought to fill in a well-conducted institution for the advance of agriculture is coming to be understood and appreciated, and Dr. Beal is right in saying that no agricultural college can rank among the best, where a professor of botany is required to teach any other subjects, and a simple enumeration of a few of the essentials of a botanical department according to his view will show how many-sided and comprehensive its equipment should be. It should have enthusiastic workers in the field, good collectors, persons well skilled in preparing plants for the herbarium. In agricultural colleges particular attention should be given to grasses and forage-plants, trees, shrubs and weeds. The herbarium should include specimens of cultivated plants, both those that are grown in orchards and vegetable-gardens as well as those that are grown for ornament. The laboratory should be supplied with so many compound microscopes that only one person should have access to the same instrument during any term; it should have microtomes, reagents in abundance, with all needed apparatus for experiments in plant physiology and for photography. It should have duplicated volumes of needed reference-books all the time in the class-room, besides a generous library. It will not be complete without a museum of plant-products and numerous greenhouses for giving different varieties of temperature, light and moisture. Beyond question, it should have a botanic garden and arboretum, where growing plants could be studied, each in the soil and exposure best adapted to it. Of course, it should have a liberal, uniformly increasing and permanent endowment, not only because a properly equipped and conducted botanic garden in itself involves an immense outlay of money, but because the botanic department of a progressive university, if it is under efficient management, will develop in all directions just in proportion to the means at its disposal.

This is a broad and far-reaching scheme, and one which we can hardly hope to see realized in the immediate future, but it is, after all, the most hopeful direction in which we can look for genuine improvement in the arts of agriculture and horticulture. No surer foundation for substantial improvement in these arts can be laid than a broader and deeper knowledge of the sciences on which they rest; and certainly the science of plant-life is chief among these. We can hardly expect that the General Government, which has been so liberal with these colleges, will

add materially to their present endowment, and we know of no way in which public-spirited men can render a higher service to their country than by following the example of Mr. Shaw, who founded the botanical garden at St. Louis. Personal fame is not the primary object of liberal citizens of this class, but in no other way could a man rear a monument more creditable or more enduring than by multiplying the facilities for instruction and research in the science of botany in its broadest sense at some of our institutions of learning, where an efficient and progressive administration of the gift would be assured.

A Reclaimed Swamp.

TO make waste places attractive is one of the self-evident duties usually neglected by the average property-owner. Our road-sides are too often covered with weeds and rubbish, and well-kept ones are local to certain communities, where an orderly sentiment has been encouraged by some energetic resident, rather than general in even the oldest settled sections of the country. But if orderly road-sides are exceptional, still more rare must be the reclamation of waste places, such as swampy lands and sink-holes, so often seen near traveled highways. That such waste lands can be made attractive by well-directed private efforts may be learned by the picture of a reclaimed swamp, whose present beauty is owing to the labors of Mr. S. C. Nash, of Clifton, New Jersey. A few years since, as has already been told in Garden and Forest (vol. v., p. 310), this tract was a low-lying swamp stretching along the main road, and covered with an ugly mass of weeds and unsightly refuse. These have been cleared, the sloping banks graded and covered with soil to smother the strong-growing indigenous plants. The low-lying portions have been widened out into basins with informal edgings, which, as will be seen, have been planted with Irises, Wild Rice, Sedges and noble Grasses. The view (page 499) having been taken from a low level fails to convey an adequate idea of the size and character of the basins which are utilized for the cultivation of Nymphæas. The water in the middle distance—at the outlet—is separated from the more ornamental basins by a low dam, which is made necessary by an occasional backing up of river-water. This section, comprising several acres, has been cleared and planted with surplus Nymphæas, and in its plainer condition is a foil to the section in the middle and left of the picture. The middle basin of about an acre, and the narrower channels leading to it, are planted with a complete collection of hardy Nymphæas, some of which have made large masses. The continual flow of spring-water having proved rather cool for tender Nymphæas, these have been provided for in tanks made by sheet-piling. These tanks are marked in the picture, and their banks masked in reality by various aquatic plants and tropical ones, of which the Musas are the most prominent in the view. Mr. Nash has grown and flowered Victoria regia in one of these tanks this summer. The upper section of this park (not shown in the picture) is a cleared space divided by a small stream from a wooded lot, from which issues water which has been led through quiet pools, reflecting many a pleasant picture of sylvan beauty.

One more feature of this reclamation must be noticed. If the picture were continued to the right the distance would show a most charming wild garden in the best meaning of that well-abused term. The wild garden here is not a plantation for those weeds and gross-growing plants exiled from good gardens, but is a garden which is being gradually planted in a natural way with the best native plants hardy in this latitude. It is a pleasure to walk through a wild garden planted so much in character that one comes across an Orchid, an Iris or some dainty native plant, with very much the same feeling of discovery that one experiences in finding the plant in its native haunts. This seems to me the art which is nature in such gardening.

The picture on page 499 is a view of one section of the middle basin, and conveys an excellent idea of effective plantings at the edge of the water and a beautiful shoreline. It, at the same time, is a beautiful illustration of Nelumbium speciosum, showing its natural habit in all stages and its effectiveness in a clear pool with ample water space. Here may be seen the leaf floating at the surface of the water, as happens when growth is first made, and other leaves in all stages, from the tiny arrow-head-like coil to the broadly undulating, perennially interesting, fully expanded specimens. Even in the picture they show the various tones of light which render them so attractive. The rambling habit of the plant is well illustrated in the detached smaller groups, which are from creeping stolons of the main growth. Many illustrations of this Lotus have been published which are not true to nature; this picture, therefore, showing its true character must prove interesting.

Mr. Nash's garden, it will be seen, is bounded at the left by the public road, from which it is in full view and easy of access, so that, while it is a private garden, it is practically a public park, open to all, and an improvement which would be welcomed in any locality. Such an example as this seems worth imitation. There are many such spaces whose reclamation would furnish interesting occupation for those fond of nature, aside from the public benefit given.

A fine consignment of Palms and Tree-ferns recently left Boston for Chicago, the plants being gifts to the Horticultural Department of the Fair, where, under the big dome of the fine building beside the lagoon, it was thought best to establish them before frost set in.

From the Harvard Botanical Garden went two specimens of Livistonia Sinensis, which are about twenty years old. For a number of years their growth was retarded by the use of small pots, but when they were planted out in the new Palm-house of the Botanic Garden they grew with surprising rapidity. Their height is now thirty-four feet to the top of the tallest leaf, while at the base of the stem they girth six feet, and the fan-shaped leaves, about fifty in number on each plant, are between five and six feet long. The third contribution of the Botanical Garden is a Seaforthia elegans about twenty-four feet in height, with a clean smooth stem up to half this height, and leaves about ten feet in length.

From his famous gardens at Wellesley, Mr. H. H. Hunnewell sent a fine Tree-fern—a Dicksonia regalis, with a stem about five feet high and thirty inches in circumference; a Pandanus reflexus eighteen feet in height, with fifty-five leaves, each about eight feet long; a Cocos Bonnettii eighteen feet high, with thirty fronds, which spread so widely that it will require a place more than fifty feet in diameter for its exhibition, and two specimens of C. coronata, each twenty-four feet tall. All these specimens, we are told, had been growing in Mr. Hunnewell's conservatory for at least twenty-five years.

The consignment was completed by three trees from the private greenhouse of Professor Sargent. These are a Kentia Wendliana, about ten years old, which was raised from the seed by Professor Sargent; a Chamerops excelsa, forty years or more of age, which is sixteen feet tall and spreads ten feet, and a Phœnix reclinata, nearly thirty years of age, which measures about fourteen feet in height and as much in spread.

Carefully packed, these admirable plants filled two cars, and as soon as they reached Chicago were to be set in place beneath the great roof, where they will have such a chance as never before to develop as rapidly as they choose. This chance will probably be particularly welcome to the two Bourbon Palms from the Botanic Garden, as, during last winter, they broke the glass above their heads several times, and when the weather became warm enough for a renewal of the glass to be needless, promptly grew six feet in the open air.

The Supposed Correlations of Quality in Fruits.

At the Rochester meeting of the American Association for the Advancement of Science, Professor L. H. Bailey read a paper on this subject, the greater part of which we herewith reproduce:

High quality in fruits, by which we mean that combination of fine texture, tenderness and pronounced agreeable flavor which renders them fit for dessert, is supposed to exist at the expense of some other character. The best fruits are thought to be tender in tree, unproductive, to lack vigor, or to be small or dull in color. This notion is one of the dogmas of horticulture which has passed down from generation to generation unchallenged, and it is the parent of the common assumption that a first-rate market fruit is almost necessarily one that is indifferent or poor in quality. The correct understanding of this general belief lies at the foundation of all advance in horticulture, for if variation in quality is always correlated with variation in some other character, we should be able to breed directly for quality by means of simple selection, taking seeds, for instance, from the tenderest tree or the least productive, to secure the highest quality in fruit. But we must first determine if the law of Goethe and St. Hilaire, that the sum of activity in any plant is fixed, with variation occurring only within the limits, is true, or if we can force the plant beyond its original bounds, and increase the sum of its activities. We must determine if the independent variation of organs which Wallace has found to exist in nature, obtains also in the garden, or if, once inside the garden-fence, the plant assumes a law of development in parallelisms. It therefore becomes a philosophical question.

Now, there are about seven characters which are commonly held to be correlated with marked increase in quality, three of which belong to the fruit itself, and the remaining four to the plant as a whole. These are: Decrease in size or seed-production or loss of high color in the fruit, tenderness, lack of vigor, short life or unproductiveness in the tree.

There are two methods of discussing my subject, the statistical and the philosophical. Fortunately, statistics are at hand for our purpose. I have selected as the basis of my investigations the well-known fruit-catalogue of the Michigan Horticultural Society. This is almost wholly the labor of T. T. Lyon, whose discriminating judgment upon the merits of fruits is not excelled in this country. In this catalogue all the varieties are graded upon a decimal scale in three distinct categories—dessert, cooking and market. Each variety is also rated in size and color. Mr. Lyon's standard of excellence in quality for dessert is high, and only the very choicest varieties reach figures nine and ten. It therefore offers an opportunity for the selection of extreme types and the elimination of all such intermediate ones as would be likely to complicate and obscure the results. The catalogue is also extensive enough to afford a safe basis of estimate; it contains 219 varieties of Apples, seventeen of Blackberries, fifty-two of Cherries, sixteen of Currants and Gooseberries, forty-seven of Grapes, seventy of Peaches, sixty-three of Pears, thirty-four of Plums, thirty of Raspberries and sixty-one of Strawberries.

I have examined for comparison the records of the size and color of all those varieties which scale nine and ten for dessert. There are thirty-eight varieties of Apples graded nine and ten, of which only three are rated small, while seven are large and two are very large. Those rated as medium to small are two, and those medium to large are three. Of these thirty-eight entries, therefore, six, or less than one-sixth, would be called small apples, and thirteen, or over one-third, are large apples, the remaining ones being classed as medium or intermediate. In other words, there are over twice as many large apples as small ones of very high quality in this list; and there is every reason to believe that what is true of the 219 varieties here considered is also approximately true of all varieties in cultivation, for the list contains a very large proportion of the total number of varieties of high quality. Of the seven Blackberries rated nine and ten, five are large, one is medium and one is medium to small. Of the sixteen best Cherries, eight are large, two very large, one medium to large, and none of them are small. Of the three Currants, one is large and the others are medium, and the two Gooseberries are large or medium to large. Among the eight best Grapes, there are three large-bunch varieties and one small-bunch. Of twenty-one best Peaches, none are small, twelve, or over half, are large, two are very large, and one is medium to large. Among twenty-one best Pears, five, or nearly a quarter, are small, three are medium to small, while six are large and two are medium to large. In this instance, the numbers of large and small are equal. In the six best Plums, but one is small. Of eight Raspberries, none are small, but four are large and two are very large. In the twenty-three best Strawberries, none are small, while six are large, and eleven, or nearly one-half, are very large.

There can be but one conclusion from these figures, and that is that quality is not associated with size of fruit. If the figures were to be interpreted as they stand, it would appear that increase in quality is usually associated with increase in size, but it must be remembered that small fruits are less likely to be propagated extensively than are large ones. It is only when small fruits possess some superlative merits, as in the case of the Early Joe Apple and the Seckel and Summer Doyenne Pears, that they are worth cultivating in competition with larger fruits. And thus it would be useless to attempt to draw any conclusions from the listed sizes of poor apples, for poor small apples are not often perpetuated. We need not resort to figures to show that increase in quality is not a necessary attendant of decrease in size. Every fruit-grower who stops to reason upon the question must recall the fact that "seedling" Apples are usually small and very poor in quality. The fallacy of associating size and flavor, as of other supposed parallelisms, arises from the fact that individual instances have been widened into generalizations. We wonder at the smallness of the Russets, the Early Joes, the Delawares, the Seckels and the Doyennes, but we forget the Fall Pippins, the Hubbardstons, the Spys, the Greenings, the Brightons, the Anjous and the Boscs. But if it is a fallacy to associate increase of quality and decrease of size, it is perhaps a greater one to associate high quality with low color. A study of the preceding tables shows that red is a very prominent character in all the fruits, and wholly green fruits, even among the apples, are rare.

In many varieties the seed production has decreased, and it has been held by some that there is a correlation between it and quality. The chief exponent of this hypothesis is Dr. E. Lewis Sturtevant, who outlined his views before the American Pomological Society at its last Boston meeting. He has made a fuller discussion of the subject in a recent paper, in which he asserts that "there seems to exist in fruits a correlation between seedlessness and quality, especially when that quality is expressed by the term tenderness of tissue. In fruits of fine quality, tenderness of the seed-coating often seems a marked characteristic, as in grapes, where the seeds of the improved varieties are distinctly softer and more brittle than in those of the wild species; as in peaches and plums, where the tendency of a split stone is often noticeable in fruit of varieties of high quality." I have made no studies concerning the strength or thickness of seed-walls in cultivated fruits, but I do not doubt that there is a general tendency toward fragility. But I cannot look upon this tendency, if it exists, as in any way related to quality. It is undoubtedly due to constant selection for small-seeded fruits. Concerning the relations of seed-production to amelioration, I have made some careful studies. I have found, as a rule, that the cultivated varieties of Apples contain more seeds than the wild European Crabs. Forty specimens of fruit of these Crab-seedlings contained a total of 256 seeds, or an average of six and two-fifths seeds to the fruit. Forty Northern Spy apples yielded four hundred and eighty-one seeds, or an average of over twelve to the fruit. Normally, the apple contains five carpels, and each carpel contains two seeds, but some of these Spys had fifteen seeds and one had eighteen. And yet the Northern Spy ranks ten in Mr. Lyon's dessert scale. I had all the seeds counted in a pound of each of thirty samples of tomatoes, representing twenty-six varieties of very different degrees of amelioration. The lowest comparative seed-production was in the Cherry Tomato, which is very near the wild type. There was found to be a general, but uncertain, increase in seed-production as the variety departs from the Cherry Tomato, but this increase bears no relation whatever to the extent of departure. Now and then an orchard-fruit appears which is almost or wholly seedless, but it is not necessarily of high quality. So-called coreless apples and pears occasionally appear, but none of them have ever had sufficient merit to warrant their extensive propagation. Barren mentions two no-core apples, one of which is recommended only for kitchen use, and the other is characterized as worthless. I do not wish to discourage the sowing of seeds from few-seeded fruits, for the practice is probably a means toward still further eliminating seeds, but I see no reason to expect any unusual increase of quality from this source. Seed-production appears to me to be subject to the same laws of variation as other attributes of plants, and it appears independently of other characters, in the same manner as size and color.

In comparing the habit and vitality of the tree in the best varieties with the poorer ones, it must be borne in mind that a tender, or weak-growing, or unproductive tree which bears poor fruit is unfit for cultivation, and such varieties do not often appear in the fruit lists. But, on the other hand, such trees are often cultivated because of some superior quality of the fruit. So it happens that the poorest trees and least productive ones described in our manuals are apt to produce fruits of the highest quality, and growers are apt to enlarge this circumstance into a generalization. But, the fact that Winter Nelis is a poor grower, that the Delaware Vine is slender and particularly liable to mildew, and that the Newtown Pippin is unreliable, is many times overbalanced by the vigorous growth and productiveness of Anjou, Catawba and Northern Spy and many others. In fact, a study of the dessert fruits in this catalogue will show that over eighty per cent. are hardy, vigorous and productive. In regard to the notion that the best fruits are usually short-lived, I have only to say that there are positively no facts to support it.

It is also generally believed that market fruits are either poor or indifferent in quality, but here again facts do not warrant the belief. It must be remembered that many of the best dessert fruits are cultivated solely for the sake of the one character of high quality, while the best market fruits are cultivated for a variety of features, as size and color of fruit, vigor, hardiness and productiveness of the tree, and quality is usually not considered. Market fruits and dessert fruits are not, therefore, strictly comparable. But if there are any good market fruits which are at the same time good dessert fruits, we shall be obliged to admit that market qualities and table qualities are not incompatible. Of the 219 varieties of apples catalogued by Mr. Lyon, nineteen are rated nine and ten for market. Of these, six, or about one-third, also rate nine and ten for the dessert, as follows: Golden Russet, Hubbardston, Jonathan, Northern Spy, Peck's Pleasant and Rhode Island Greening. Of these six, four rate the same for both table and market and two rank one higher for market than for table. Moreover, there are four other varieties which rank as high as eight in quality, which is two points higher than the Baldwin. Of the ten best market blackberries, four are included in the select dessert lot. Fourteen cherries rate nine and ten for market, and just half of them are in the select list. Of the eight best market currants, however, only one is rated high for dessert, but the currant has not been developed in the direction of high quality. Of the four market gooseberries, two are in the other list. Mr. Lyon admits but six market grapes, of which one is a superior table fruit. Of the market peaches, nearly one-fourth are dessert fruits. One-fourth of the market pears rank highest for dessert, while one-third of the remainder rank as high as eight, which is the rating of the Bartlett and Sheldon. One-seventh of the best market plums are best for dessert, and nearly a third rank eight. Of the dozen best market raspberries, one-fourth are best table sorts, while half of them rank eight. Over a third of the market strawberries are dessert varieties. All these facts show conclusively that high quality is not incompatible with that combination of characters which makes a fruit good for marketing, and they show that a very large proportion of our market fruits actually are dessert fruits. And if we take the average quality of all the fruits ranking nine and ten for market we find it to stand uniformly at seven or above for dessert, or higher than medium quality. Thus the average table rating of all the high market apples is 7.1, or over one point higher than the Baldwin. The average of the market blackberries is 8.5. This instance is particularly interesting, because the blackberry is probably the fruit oftenest cited as decreasing in quality in proportion as it is increased in size. Cherries average 7.3, and grapes 7.8. Peaches average 7.6, which is higher than the rating of Late Crawford, Barnard and other standard sorts. Market pears stand at 7.7, or higher than Angouleme, Flemish Beauty, Superfine and Louise Bonne. Plums average seven. Raspberries give an average of 7.8. Strawberries are eight, which is the rating of Kentucky, Miner, Ohio, Sharpless and Charles Downing. It is impossible to construe these facts to mean anything else than that all desirable characters of fruits may progress simultaneously.

In this connection we should discuss the popular notion that the berry fruits decrease in quality when they are brought into cultivation, because the decrease is supposed to be due to increase of size and vigor. Most people think of the wild strawberries and blackberries of youthful rambles as possessing unusual sweetness and aroma; and I do not doubt that it is true, even allowing for the exaggeration of retrospect, that wild berries are sweeter than those which we commonly obtain from the garden. But I know of no reason for believing that wild fruits are actually sweeter than tame ones. I am convinced that it is mostly a question of ripeness. To be sure, there may be cultivated varieties inferior in quality to some wild berries, but, as a rule, I do not believe that cultivation has had the effect of decreasing quality. I have given particular attention to this question this year with blackberries, which are very generally considered to have lost sweetness by transfer to the garden. Among garden varieties I have studied Agawam, Early Cluster, Early Harvest, Ancient Briton, Snyder and Stone, and two of these are rated as low as eight for dessert by Mr. Lyon, while the poorest varieties go only as low as seven. In the study of wild berries, I visited a region which I had known in boyhood, and which I have always remembered because of its great and luscious blackberries. But the comparison was greatly in favor of the tame berries if they are allowed to remain upon the bushes until ripe. In the wild patches we practice an unconscious choice, and pick only those berries which please us. We pick the ripest and the best. It is noticeable, also, that we pick the largest, and base our judgment upon them, while we should find the best quality in the smallest berries if our assumed logic is sound. Cultivated berries, when marketed, are necessarily picked before they are ripe, and they never reach their full quality. And even when picked for table use, blackness in the blackberry and redness in the strawberry are usually considered as measures of ripeness. But the true measure of ripeness is softness. A well-grown fully ripe blackberry, which falls into the hand when the cluster is shaken, possesses a tenderness, juiciness and sweetness which I have rarely found in a wild berry. And the same is true, in my experience, of strawberries and raspberries.

But we do not need to rely upon individual tastes, for all chemical examinations which I have been able to find show that sweetness increases with the increase or intensification of culture. This would seem to be almost necessarily the case, because the ultimate aim of cultivation is to supply more food to the plant, and this food in fruits is largely potash, which bears a definite ratio to sugar. Dr. Stone reports a series of interesting experiments in this direction at the Massachusetts Agricultural College. "A wild specimen of Vitis Labrusca (our common Wild Grape) was torn apart at its root; one-half was left in its natural condition, the other transplanted to cultivated ground and treated with nitrate of potash and bone superphosphate. At the end of three years fruit from the cultivated vine contained twelve per cent. more potash and twenty per cent. more sugar than that from the wild one." Analysis of wild and cultivated strawberries showed a great increase in potash in the cultivated variety. "But the change was not confined to the mineral elements alone, for the same analysis showed that the proportion of sugar to acid in the wild species is as two to one, while in the cultivated varieties it is increased to six to one or more." Dr. Stone further declares that "potash fertilizers have decidedly improved the desirable qualities of fruits. Wherever the percentage of this element has been raised, the change is accompanied by an increase of sugar and decrease of acid." Dr. Stone has made a subsequent examination of the chemical composition of strawberries at the Tennessee experiment station, and he finds that, "in the varieties examined, the proportion of acid to sugar was 1 to 3.5. For the wild strawberry, the only references available, and these very meagre, show a corresponding proportion of 1 to 2. This indicates that a change for the better has been made, but it is far from probable that the limit has been reached." Fresenius gives the sugar in cultivated strawberries as 7.5 per cent., and the free acid as 1.13, and in the wild berries as 3.2 and 1.6 per cent. respectively. Cultivated raspberries, according to the same authority, contain 4.7 per cent. of sugar and 1.3 per cent. of acid, while wild ones contain 3.5 per cent. of sugar and 1.9 of acid. Parsons finds that sugar increases rapidly in oranges as they depart from the wild type, although free acids do not show a corresponding decrease. Thus the wild bitter-sweet of Florida contains .84 of cane-sugar and 5.71 of glucose; the sour, .97 cane-sugar and 3.36 glucose; the common oranges, 4.38 and 4.60 respectively; russets, 4.51 and 7.29; mandarin, 8.07 and 4.77. The figures and experiences uniformly show that amelioration in other qualities is accompanied by an increased sweetness; and every one who has tested seedling or wildling fruits can bear testimony to the same fact.

But if all statistics show that high quality does not proceed at the expense of other characters, practical experience in the origination of fruits shows it as well. As a matter of fact, seeds of small or low-color fruits, or from tender or unproductive varieties, do not give a larger proportion of varieties of high quality than seeds from large, highly colored and vigorous kinds. And it is here worthy of remark that while most

pomologists hold to the correlation of quality with decrease of other characters, they at the same time uniformly recommend that in producing new varieties only seeds from the largest, finest and hardiest varieties should be used.

It is evident from our discussion that quality and other characters of cultivated fruits appear independently of each other; that there is no true correlation between these characters. There is a general increase in all characters as amelioration progresses—at least in all characters which are particularly sought by horticulturists; and this fact must ever remain the chief inspiration to man in his efforts to ameliorate plants.

New or Little-known Plants.

New Orchids.

Cymbidium Humblotii, Rolfe.—A fine Madagascar species, the second now known from that island, with a large branching panicle of green and black flowers, which resemble those of Cœlogyne pandurata. A plant was exhibited at a meeting of the Royal Horticultural Society on June 7th last by C. Ingram, Esq., of Godalming, and was awarded a botanical certificate. Dried specimens were sent home by Monsieur Humblot, and it is highly probable that the living one came from the same source.—*Gardeners' Chronicle*, July 2d, p. 8.

Oncidium Rolfeanum, Sander.—A New Granadan species allied to O. Kienastianum, Rchb. f., and O. trilingue, Lindl. It was introduced by Messrs. F. Sander & Co., of St. Albans, who exhibited it at the last show held by the Royal Horticultural Society in the Inner Temple Gardens, when it was awarded a botanical certificate.—*Gardeners' Chronicle*, July 9th, p. 34.

Phalænopsis × Artemis, Hort.—A pretty hybrid raised from P. grandiflora crossed with the pollen of P. rosea. It bears some resemblance to P. × intermedia. It was exhibited by Messrs. James Veitch & Sons, of Chelsea, at a meeting of the Royal Horticultural Society on July 12th last, and received an award of merit.—*Gardeners' Chronicle*, July 16th, p. 75.

Dendrobium chrysocephalum, Kranzlin.—A species belonging to the section Pedilonum, with golden-yellow flowers very similar to those of D. viridiroseum, Rchb. f., in shape. It was introduced by Messrs. F. Sander & Co., of St. Albans, and flowered in the collection of Prince Lichtenstein, of Moravia.—*Gardeners' Chronicle*, July 30th, p. 122.

Masdevallia Harryana Gravesiæ, Rolfe.—A pure white variety of this handsome species, and exceedingly rare. It was introduced by Mr. F. Mau, of Orange, New Jersey, and flowered in the collection of Henry Graves, Esq., of the same place.—*Gardeners' Chronicle*, July 30th, pp. 122, 131, fig. 21.

Cypripedium × Bryani, Hort.—A very handsome hybrid raised from C. Philippinense crossed with the pollen of C. Argus, in the collection of N. C. Cookson, Esq., of Wylam-on-Tyne. It received an award of merit from the Royal Horticultural Society on July 26th last.—*Gardeners' Chronicle*, July 30th, p. 138.

Kew. *R. A. Rolfe.*

Foreign Correspondence.

London Letter.

New Orchids at the Sale-rooms.—There is an inundation of new or so-called new Orchids in the English market now, chiefly in the London auction-rooms. Collectors display more energy than ever in sending home large quantities of plants, with tempting descriptions of the beauties of their finds and graphic accounts of the terrors and trials they had to undergo to procure them. The old style was quite different. The collector was a secret worker, his movements were unknown to all save his employer, and if he suffered much there was little said about it. Now every importation has a history, an attractive one, and "our collector" tells of the cannibals, venomous serpents, ferocious animals, treacherous servants, etc., etc., which he had to encounter in his search for the plants which are now offered at any price you like, only please note there are no more because "our collector" says he has gathered every one or an earthquake came and swallowed all that he left. The perils of the "Orchid hunter" have already been the subject of a serial story in an English weekly. Meanwhile there is no difficulty in getting men to go on these perilous errands, and as a rule they thrive wonderfully well, spite of serpents and cannibals.

This "romancing" does no harm, indeed it is often interesting. One wonders how far the collector will go in his desire to spin a yarn, which is meant, we suppose, to inspire rival collectors with fear. Mr. Grant Allen recommends any one who has thoughts of taking up literature as a profession to buy a broom and sweep crossings instead. The plant collector now talks in the same strain. Meanwhile thousands of pounds are spent on Orchids now where tens were spent before. There is certainly no sign of abatement in the Orchid fever.

Cycads.—The collection of Cycads at Kew is the richest known. It comprises many very large specimens, some of which frequently produce very fine cones. There are more cones than usual just now, the following being specially noteworthy: Dioon pectinatum, a newish species, previously called D. spinulosum. It differs from D. edule in having broader, thicker pinnæ, toothed near the apex. The cone, a male, is one and a half feet long by four inches in diameter. D. edule is also in fruit, the cone, a female in this case, being as large as a man's head. Encephalartos villosus has two beautiful cones rising from the centre of a grand rosette of arched leaves eight feet long. Each cone is one and a half feet long, half a foot in diameter, and built up of regular angular fleshy scales colored soft orange, not unlike a huge pine-apple. When the scales open and partly show the rich scarlet seeds the effect is particularly attractive. E. Altenstinii, the giant of the genus, has a head of leaves fifteen feet through. It is a grand plant for a large house, grand as any plant I know; moreover it is as good-natured as a Dicksonia. There are several very large specimens of it, one or other of which is always in cone. There are a pair of male cones eighteen inches long on one of them now. Macrozamia spiralis has a short conical stem two feet in diameter and long flaccid leaves of a rich green color. The one in cone now has no less than six fine male cones, each nine inches long and colored pale greenish yellow. There is not much difference in habit between this and M. Fraseri and M. Moorei. Another of the same stamp, named M. Dyeri, has recently been added to the Kew collection.

These large sturdy Cycads are most valuable plants for furnishing large houses. They are always good to look at, magnificent in every sense, and they are, as a rule, among the easiest of plants to cultivate. Large stems of them may be sent long distances without suffering, most of the big specimens at Kew having been obtained from Australia or Africa by means of stems dug up and sent without any soil in dry boxes. Some years ago a large stem, ten feet long, of M. Moorei, which had been sent from Australia by Sir F. von Mueller, showed signs of decay at the base of the stem. To save it the stem was cut in two and the upper half planted as a cutting. It rooted in time, and is now a fine healthy specimen. The South African Cycads, such as Encephalartos villosus, E. Caffer and E. Altensteinii, ought to thrive in the open air in such states as California.

Stevensonia grandifolia.—This is a Palm of more than ordinary interest. It is a native of the Seychelle Islands, where it is said to be common, but, as is the case with several other genera found in those islands, it does not occur in any other part of the world. It is monotypic. It grows to a height of fifty feet, and has a slender, annulated, unarmed, dark brown stem, the upper part of which is clothed with the hard sheathing bases of the leaves. Young plants have numerous black spines an inch long on the leaf-stalks, but as the plant increases in size these

spines gradually disappear. The leaves are large, cuneate-obovate, bifid at the apex, with marginal divisions or segments, which are notched at the tip. The blade is rich green, margined with orange and blotched with reddish brown. In very young plants the orange-colored petiole, midrib margin and blotches of the leaves are really ornamental.

For the discovery of this Palm we are indebted to Mr. Duncan, once a young gardener at Kew and afterward curator of the botanical garden at Mauritius. He found the Palm in Round Island in 1855, and sent three seedlings of it to Kew. He named it in compliment to the Governor of Mauritius, who did much to assist Duncan in his botanical work. One of the three seedlings disappeared from Kew in 1857 and reappeared in a Continental garden in 1857, a circumstance which led Wendland to name the plant Phœnicophorium, or Stolen Palm, a name by which it is still known. Another of the seedlings died, but the third still remains, and is now one of the handsomest specimens in the Palm-house. It is thirty feet high, with a stem nine inches in diameter and eleven fine leaves, each with a curved, channeled petiole four feet long, and a broad entire blade seven and a half feet long by five feet wide. This plant is now flowering for the first time. The inflorescence is at first enclosed in a club-shaped woody spathe three and a half feet long, which splits longitudinally and falls off, exposing a branched panicle a yard long clothed with bright yellow flowers. As the plant is monœcious, it will probably produce a crop of fruits. A figure of it has been prepared for the *Botanical Magazine*.

Stevensonia, or Phœnicophorium, is rare in cultivation, notwithstanding that the seeds are easily procured from the Seychelles and the decidedly beautiful character of the young plants. Like all, or nearly all, the Palms from the Seychelles it requires a tropical stove temperature and plenty of moisture all the year round. It is peculiar in being so very spiny when small, and spineless when large; it is also remarkable in the rusty red blotches on its leaves, which might easily be mistaken for the marks produced by insects; indeed, I have heard of a plant being condemned by the judges at a flower-show on account of these "unhealthy" spots.

Other Palms, which are endemic in the Seychelles and monotypic, are Verschaffeltia, Roscheria, Nephrosperma Deckenia and Lodoicea, the double Cocoa-nut. These are all in cultivation at Kew and in other gardens where Palms are in favor.

London. *W. Watson.*

Fig. 84.—Part of a Reclaimed Swamp, near Clifton, New Jersey.—See page 494.

Cultural Department.

Grafting Grapes.

IN the vineyard districts of New York, the matter of Grape-grafting is becoming an important one for the growers. Many vineyards which are now in bearing consist of varieties which, when planted, promised abundant returns. But all the promise was not fulfilled to the satisfaction of the grower. There are many men who would be glad if their vineyards were bearing other varieties of grapes than those now produced, and the question whether these vines could be grafted with the desired varieties has been discussed with considerable earnestness. The Cornell Experiment Station has undertaken to throw some light upon the matter, and during the past spring several methods of grafting the Grape were tried. Some of the methods which give the best results in Europe were followed as well as some which are not in common use.

Although the season's work shows some marked failures, still the lines in which future work should be carried on are quite clearly defined.

About twenty vines of the Red Wyoming Grape were used for each kind of graft, and cions of the Niagara were inserted. With one exception, the cions were about ten inches long and ordinary cleft graft. The stock was cut off about three inches above the ground, and after the cions were inserted all cut surfaces were covered with grafting wax. None of the cions lived.

(2) The same method was again adopted, but the wounded portions were protected with a thick layer of clay and cow-

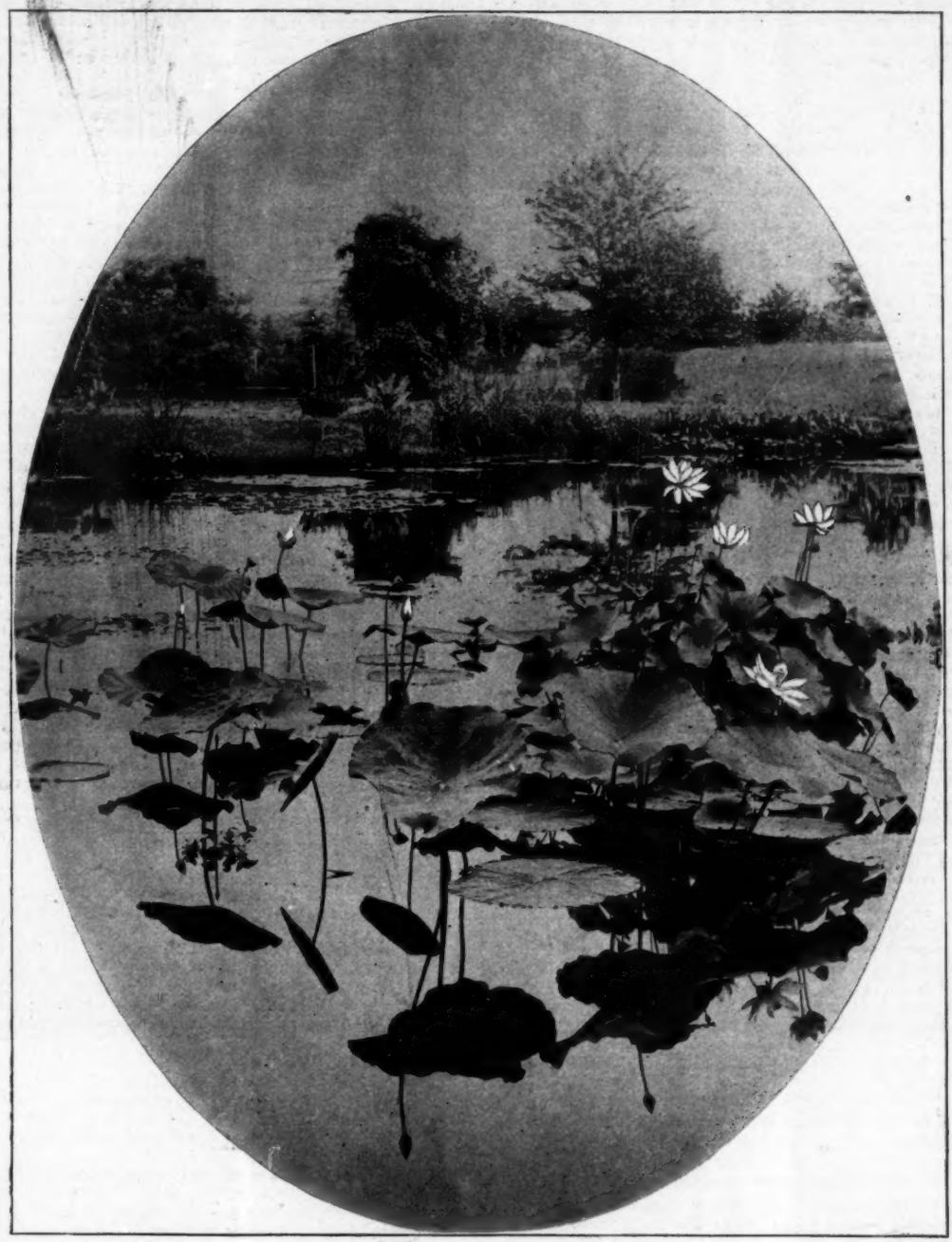

Fig. 85.—The Sacred Lotus in a Reclaimed Swamp.—See page 494.

carried two or three buds; the stocks were six years old. The work was done April 4th, the weather at the time being quite warm and the sap was flowing freely. The following is a brief outline of the various methods used and the results reached:

(1) In this case the cions were inserted in the stock by the manure, mixed in equal proportions. This dressing is said to be of much value in Grape-grafting, but in this case its virtues were not manifest. All the cions died.

(3) This method is called by Baltet side-grafting with an oblique cleft. A slanting cut is made downward on the side of the stem, at any desired height, but the knife is drawn

down much further on the side toward the handle. Into this oblique cut a wedge-shaped cion is inserted and tightly bound. No wax was applied. None of the cions grew.

(4) The operation was performed as described in 1, but the stock was cut below the surface of the ground and just above the highest roots. All cut surfaces were covered with common grafting wax, after which the earth which had been removed was replaced. This method gave better results, for about sixty-one per cent. of the cions made a fine growth.

(5) The work was done as in 4, but no wax was used. Sixty-eight per cent. lived.

(6) The stock was cut below the ground, as in 4. Two longitudinal V-shaped cuts, about one and one-half inches long, were made upon opposite sides of the stubs, and the cions were cut so that they fitted into these grooves as neatly as possible. They were then securely tied, but no wax was applied. In the fall, eighty-six per cent. of the stubs carried vigorous canes.

(7) The stock was prepared as in 4. Upon one side of the stub the bark was cut away, so as to leave a flat, smooth surface about two inches long and half an inch wide. The cions were cut about eighteen inches long, and eight or ten inches from their upper extremities a cut similar to that in the stock was made, only it was not so wide. The two cut surfaces were pressed together and firmly tied, the lower extremities of the cuttings being buried in the soil. This method gave the best results, for fully ninety-three per cent. of the stubs (or the cuttings) carried canes in the fall. The growth was much stronger than that made by ordinary cuttings, for in some cases it aggregated fully seventy-five feet.

From these experiments it would appear that the best place to graft Vines is under ground; whether wax or any covering other than earth is beneficial still remains to be determined. In these experiments the wax did not seem to do very much good. If the cions were inserted by the cleft graft and almost buried with earth, excellent results would probably be obtained, and this method can be most safely recommended. Methods 6 and 7 may even be better, but the operations are more tedious.

The French have not contented themselves with using only mature wood in grafting the Grape; they have given much attention to this subject, and some advise the use of soft wood. The following extract from an article by René Salomon, which appeared in *Vigne Americaine*, will give a fair idea of the manner in which this work is done:

"Herbaceous grafting is very easily performed; in half an hour a novice can become so skillful in the operation that from eighty to ninety per cent. of the grafts will be successful, provided: (1) That the vine is in its most active period of growth; (2) that the weather is sufficiently warm (at least sixty-five degrees, Fahrenheit); (3) that the shoots used are sufficiently strong, and neither too hard nor too soft; they should still be flexible, yet the centre should be free from pith; (4) that the cions are placed beneath the fourth bud from the extremity of the shoot; (5) that the cions contain at most only two buds. After being cut they should be kept a few days in damp fresh grass, and they are then ready for use. In fact, the most essential condition for success is the more or less herbaceous condition of the cion and the stock."

The splice-graft is the method recommended by Salomon. He advises making the oblique cut through the centre of the nodes, both in the cion and in the stock. The cuts are made as nearly the same as possible, and the two pieces are then firmly tied together with a rubber band, for this is preferable to raphia, on account of its elasticity. After the operation the graft is protected from the sun and rain for about ten days, by simply rolling a grape-leaf about the place of union. In four weeks the rubber may be removed, for at that time from two to three inches of growth should have been made by the cion.

Cornell University. *E. G. Lodeman.*

The Herbaceous Garden.

AS yet, although it is almost mid-October, there has been no frost to cause serious injury to outdoor vegetation. The Golden-rods and native Asters are still quite gay with flowers, and some of the other native plants are equally effective, although they are not so common or well known. The Boltonias, for instance, are free-growing plants of graceful habit, flowering profusely in August, September and October. They resemble the Asters closely, but they are of a more vigorous character, with large, smooth, lanceolate, pale green leaves. Boltonia glastifolia, said to be a form of B. asteroides, attains to a height of about six feet, and it is the first to bloom. The heads are about an inch and a quarter in diameter, the ray florets being either pure white or of pale purple color, and those of the disk yellowish. B. asteroides flowers much later, and is now a fine mass of bloom. This, indeed, from the gardener's point of view, is the only material difference between it and B. glastifolia. The flowers of B. latisquama are to be seen side by side with those of B. asteroides, but this plant is only about four feet high, and it has smaller and narrower leaves than the latter. The heads, however, are much larger, being somewhat over two inches across, and the rays are bright purple. These three plants are perhaps the best of the genus for garden purposes. They grow well in ordinary soil, and are easily propagated from seeds or by division of the clumps in spring.

The Vernonias, commonly called Iron-weeds, are conspicuous for their dense cymes of dark purple heads. The flowers are perfect, and thus the individual heads have the appearance of double Daisies. Vernonia altissima is about eight feet high, leaves oblong-lanceolate, serrate, cymes very dense, and the flowers are at their best in August and September, the heads measuring almost two inches across. V. Noveboracensis is very much like the last-named species. The leaves, however, are a trifle narrower, their serratures less prominent; the heads smaller, of lighter color, and developed in September, lasting into October, and the cymes are loose. V. Arkansana blooms at the same time as V. Noveboracensis; the heads and cymes are likewise similar, but the leaves are linear-lanceolate and denticulate. Vernonias and Boltonias make satisfactory progress under the same treatment, and they are propagated under the same methods. They look well in shrubbery plantations, and the flowers are admirable for cutting.

Each succeeding autumn adds to the popularity of the double-flowered varieties, Plenus and Soliel d'Or, of Helianthus multiflorus. They are as useful as Chrysanthemums or Dahlias, with the advantages over those plants of perfect hardiness and a rigidity of the flower-stems, which would be a vast improvement to the latter. They are about four feet in height, and the growth is free and compact. There are few better decorative plants, as they bloom freely from early autumn until cut down by severe frost. The flowers have no superior for cutting purposes, and they are more valuable because they will last two weeks in perfect form and color if cut soon after full development and given proper attention in the matter of water. The florets of Soliel d'Or are all large, but in Plenus those of the outer circle are more conspicuous than those of the centre. I prefer the more uniform structure of the flowers of the first-named, but both plants are eminently desirable. They are well adapted for town gardens, growing and flowering freely in almost any soil or situation, and they are readily increased by division. It should not be forgotten, in speaking of varieties of H. multiflorus, that multiflorus itself is merely a garden name for a form of our native H. decapetalus.

Cambridge, Mass. *M. Barker.*

Roses.

APPARENTLY the most interesting among the newer Roses at the present time is Madame Caroline Testout. Many of the large trade-growers have already spoken in praise of this hybrid Tea, and the supposition now is that the new-comer will usurp the leading position among pink Roses so long held by La France. The flowers of Madame Testout are very large, and of a specially pleasing shade of pink; this color extends to the outer petals also, a quality not found in La France. As far as known at present, it is a strong-growing variety, producing fine foliage. As a rule, the buds are solitary, this also being a point in its favor, as disbudding is thus made unnecessary. As an indication of the anticipated popularity of this Rose, it is stated that a single selling-agent has secured control of a stock of 20,000 young plants for distribution next spring.

Another new Rose to be distributed next spring is the pink sport from American Beauty that originated with Mr. John Burton, of Philadelphia. This certainly seems to be an improvement on its parent, being equal in size and fragrance, and of a beautiful shade of pink, the color far superior to the dull hue so often seen in American Beauty, and especially after this Rose has been cut for a day. The sport retains its brightness for quite a length of time after being cut, and will undoubtedly prove a more satisfactory flower for the retail florists to handle. In token of his confidence in the good qualities of the Rose in question, Mr. Burton proposes to distribute the flowers in the regular course of trade this winter, thus allowing those interested a good opportunity to examine and compare the new Rose with its parent and other varieties

before purchasing plants in the spring. It may also be noted that as yet this sport has not been named, so that it cannot be more definitely spoken of than "Burton's sport from American Beauty."

Among indoor Roses in general this is one of the critical periods of the year, from the extreme liability of some varieties to contract mildew. Proper attention to watering, ventilation and heating, with applications of sulphur, removes this trouble readily. Probably the best method of applying the sulphur is by means of a bellows, after which the house should remain closed for a time in order to allow the fumes to operate on the fungus, keeping in mind the fact that if the temperature is allowed to run up above ninety degrees there is much risk of injuring the Roses.

The night temperature of a rose-house is rather difficult to regulate at this season without very careful firing. Fifty-eight to sixty degrees is the most satisfactory temperature for a majority of the varieties in general use, while special varieties may need either higher or lower than this average.

Difficulty is usually experienced in successfully growing a considerable number of different varieties in one house, but I recently saw a house in which were Papa Gontier, Catherine Mermet, Bride, Niphetos, Madame Hoste, Perle des Jardins, W. F. Bennett, Souvenir of Wootton, Madame Cusin and Madame de Watteville, and the grower informed me that the only varieties he had any trouble with were Bennett and Wootton; at the time I saw them even these were in nice condition.

The method of staking Roses, to which reference has several times been made in Garden and Forest, continues to grow in favor—that is, the plan of using galvanized steel wire rods in place of wooden stakes. These are kept upright by securing them at the top to a longitudinal wire attached to the roof of the house. The galvanized steel wire is very durable, does not require any painting, and forms the neatest possible support for the plants. It has in addition the merit of cleanliness, for it does not harbor vermin, as is frequently the case with wooden stakes. The canes that have frequently been used for this purpose form admirable hiding-places for the Snout-beetle (Aramigus Fullerii), and this pest is not slow in discovering any such cover. Fumigating or vaporizing with tobacco extract will be found necessary from time to time, vaporizing being the better method when properly applied, and less liable to injure the color of the flowers; but even this will affect the color if given too freely.

Holmesburg, Pa. *W. H. Taplin.*

Lilies in Autumn.

MANY of the more valuable horticultural experiences are the results of accident, and not infrequently a little misfortune as well. Last spring one of our seedsmen had a number of cases of assorted Lilies left over from spring sales. After their journey from Japan in November of the previous year, and having been kept perfectly dry until the middle of May, the prospect of flowers from these bulbs was poor indeed. In hopes of saving something out of them, we planted the lot about May 20th. To our surprise, nearly all of them came up and made a vigorous struggle for life. The result was that this morning (October 10th) we have gathered from a bed of L. Tigrinum splendens as fine spikes as ever were cut in July. The plants of L. speciosum did nearly as well, but their flowers were over last week, excepting L. speciosum Præcox, which are in bloom, although the flowers are considerably damaged by the storm. L. longiflorum bloomed well, but were all gone a month ago. The plants of L. auratum behaved as they always do; some came up quickly, and flowered in August, and there have been flowers in the row every day since, while some are just coming up. These we shall pot for the greenhouse if there are enough to make it pay.

This experience has taught us that the season of Lilies can be kept up until after a hard frost with but little trouble, and add greatly to the display of autumn flowers. From the show these Tiger-lilies are making, it is evident they should not be allowed to bloom at any other season, as their deep, rich orange-crimson flowers are now in harmony with all their surroundings. For autumn flowers the bulbs should be taken up in November, packed away in dry sand or sphagnum-moss, and stored in some dry cool place until about May 15th. The low price of the bulbs of the L. tigrinum should make them popular autumn flowers, when they can be had with so little trouble and expense.

Floral Park, N. Y. *C. L. Allen.*

Anthracnose of the Pear.—There is a considerable decay of the maturing pears due to an anthracnose. This rot of the fruit is quite different from any other of the decays met with under similar conditions, and seems to have escaped identification. The fruit may be attacked at only one place, which spot soon turns brown and becomes sunken, as if it had been pressed upon with the end of the thumb. A little later the surface of the sunken place becomes covered with dark pimples, which are broad, instead of sharp-pointed, and finally become almost black. These pimples are the places where the spores are produced in great numbers upon the tips of projecting threads. The darkness of the pimples is due to the multitude of small black bristles which project in all directions from the centre of the mass of spore-bearing tips. Each pimple, in other words, is like a minute chestnut-bur, with microscopic spores borne between the spines.

A similar disease has been common upon the tomato during the season now closing. This trouble of the pear may be met with in the market, where it causes ruin to a fruit in a few days. Pears left upon the ground also exhibit the same, and become a means of propagating the anthracnose.

Rutgers College. *Byron D. Halsted.*

Correspondence.

The Future of the Fair-grounds.

To the Editor of Garden and Forest:

Sir,—What will eventually be the fate of the World's Fair-grounds at Chicago? All the buildings, except, possibly, one, will, of course, be removed; but a great deal of labor and of art has been bestowed upon the site as such, and how much of this will prove to have been expended for a temporary purpose only?

The northerly portion of the grounds had been laid out as a park before the Fair was proposed. This portion has necessarily been somewhat altered, but can easily be restored to a condition equal, or superior, to its former one. If Mr. Atwood's beautiful Art Gallery is preserved, as its fire-proof walls will permit, necessitating only the substitution of marble or terra-cotta for the present external covering of "staff," it will be a priceless addition to this part of Jackson Park. Moreover, this park is intimately connected with the new lagoon and its charmingly planted island, where the Japanese temple and garden will be permanently maintained; and it will not be difficult to transform the areas around the lagoon, now covered by great buildings, into harmony with its shores and with the regions further to the north.

But beyond the lagoon to the southward the grounds have been disposed in a very different way. Here the scheme is a formal one, and verdure does not enter into it at all. Here there is not only the fine, wide, curving esplanade along the lake-side, but the great rectangular basin, running in at right angles to the lake-shore, and branching out in front of the plaza into straight wide canals. At present the effect of the grounds, as a whole, is as harmonious as it is magnificent, terraces like those which border the basin and canals being carried for a space along the sides of the lagoon, where one of the canals debouches, thus intimately uniting, in a way which satisfies both the mind and the eye, the naturalistic and the formal portions of the great design.

But what is to be done with the formal portions after the Fair is over? Must the basin and canals be destroyed, and, if not, how can they be fitted into any artistic gardening scheme? An interesting answer to this question was recently given by a writer in the Boston *Herald*. "On the terraces which border the basin and canals," he says, "and on the wide level expanses left by the removal of the buildings . . . it would be possible to lay out a formal garden on a great scale, elaborate in design and with rich and brilliant effects in the harmoniously blending and contrasting colors presented by extensive flower-beds and formal shrubberies, studied as carefully with reference to coloristic impression as any woven or embroidered fabric in its conception. Such a treatment of that portion of Jackson Park would be a revelation in the field of formal gardening, and its success, which could not fail to be great, would go far toward creating a distaste for the atrociously bad art of so much of the prevalent methods in flower-bedding effects, repellant in both their awkwardness of design and their discordant colorings."

This interesting suggestion would, we think, offer an ideal solution of the problem but for one important fact. There is another name for formal gardening; it is also called architectural gardening, and in this name we find a hint of the obstacle which lies in the way of the easy realization of the proposed scheme. An architectural garden implies the presence of a work of architecture. A formal garden is the

natural accompaniment, extension and, so to speak, repetition of the straight lines and symmetrical masses of a building. It may be only a few rods square, or it may be as vast as the park at Versailles. But, whatever its size, it cannot look well—because it cannot look right and sensible—unless its formality is explained and justified by the presence of some structure with which it is intimately connected. As the basins and canals of the World's Fair are to-day, they are eminently beautiful because eminently right. The eye understands at once that they were planned as a means of approach to the magnificent structures which stand around them, and with which their own magnificence, in size and adornment, is in perfect keeping. But destroy the buildings and they would lose their purpose. They are not features which ought to exist by themselves, and they would not exist for the garden, should it be established; the garden would evidently exist for them. They would have no adequate purpose, and, lacking this, they would lose their artistic value and charm. If the great peristyle at the lake-shore end of the basin could be preserved with its flanking buildings, if a large but low structure for some public use could replace the Administration Building, and if a smaller structure could be placed at the southerly end of the canal, which the entrance to the stock-yards now finishes so finely, then indeed the treatment of the remainder of the grounds might be carried out as the writer in the *Herald* suggests, with a good prospect of producing the finest formal garden in the world. The finest, that is, in which avenues of trees do not play a conspicuous part, for such avenues ought not to be attempted where they cannot be perfectly developed, and it seems improbable that such could be the case where this part of the Fair now stands.

If, then, Chicago is willing to build appropriate structures around this basin and canals, the problem they offer will find a delightful solution. But they would have to be built from the ground up. The present ones, excepting the peristyle and its flanking halls would not be appropriate; and even if they would, they could not be preserved, for their walls are of lathing, not of solid brick, as are the necessarily fire-proof walls of the Art Building.

The mention of this building brings a regretful thought. For the purposes of the Fair its best place is its present place, and if it is preserved, we could not, for its own sake, wish to see it on a more beautiful site. But for the sake of the great formal garden which might be created around the basin and canals, one is tempted to wish that it had chanced to stand where the Administration Building stands. Then, a formal garden covering all this portion of the Fair-grounds would indeed be appropriate; and, especially if Mr. McMonnies' splendid fountain at the end of the basin could likewise be reproduced in marble, its general effect would indeed be one which any city of the world might begrudge to Chicago. But this is a dream impossible of realization. One can only hope that Chicago may see its way clear to preserving the Art Building where it is, and also to erecting other buildings which will justify the preservation of the basin and canals, and their inclusion in a great architectural gardening scheme.

Boston, Mass. *X.*

[Whether or not great buildings are essential for formal gardening it is not our purpose now to discuss, but symmetrical arrangements are, without doubt, useful and appropriate wherever great crowds are to convene for any purpose. This seems to justify the Mall in Central Park and the Greeting in Franklin Park, Boston. We do not think, however, that the design of the Fair-grounds would justify any attempt to convert them hereafter into a formal garden. In the first place, if an artist wished to design an architectural garden with water in it he would very probably select a different form from the water scheme in Chicago, which relates to the great buildings about it, supporting them, exhibiting them to better advantage, and furnishing means of access to them. The basin with its arms is reasonable now with the buildings about it, but, no doubt, a hundred better plans could be devised if the water was meant to be part of a great symmetrical garden.

This makeshift propensity to force things to answer some end for which they were not designed and for which they are therefore but imperfectly adapted, seems to have become one of the acquired vices of our national character. Of course, it was natural, in so great a work as that at Chicago, that this propensity should manifest itself at once, and the fact is that a hundred enterprising persons have set out to hunt up reasons and excuses for making the expediential and temporary structures of the Exposition to answer for some end which was not thought of when they were designed, and for which they can by no possibility be well adapted.

Besides this frontier feeling which "guesses we can manage to make it do," there is the thrifty suggestion that it is a great waste of opportunity not to use this great basin to some noble end. But the fact is that the walls of this great basin, like all the other structures, and even the grounds themselves, are of the most temporary character. As Mr. Olmsted has well stated, what they have been making in Chicago is a "camp"—a place to be occupied for a brief period only—and their work is good or bad as it is adapted to serve a definite purpose during that period, and no more. The Art Building is exceptionally substantial, but this is not so because it was meant to be fitted for any more distant and lasting purpose than the other structures, but because no valuable pictures would have been sent to a building which was not secure from injury by fire, tornadoes, mobs or earthquakes. What has been said of the temporary purpose of the structures in general applies with increased force to the canals, basins and terraces. The surface staff is laid upon a wall of slender piles and planking, which are only meant to be strong enough to hold up the banks for a year. Not only will the staff be peeling off and breaking soon after that, but the timbers and planks will be springing out and giving way, and in a few years natural forces will warp and crack and crumble the walls, and begin the work of establishing an irregular, meandering shore-line which is wholly agreeable as the boundary of water-courses in a park when it is prepared with a natural motive, but wholly unsuitable to an architectural garden.

Besides this, the apparent high ground of the Exposition is in reality nothing but deceptive ridges which enclose great craters now covered by buildings and terraces. There is not an acre of ground now having an architectural aspect upon which a piece of good permanent formal garden could be made without great outlay for grading and establishing fixed architectural conditions. Looking at the Fair-grounds as a site for a great public park for Chicago in future years it would be much cheaper to provide agreeable natural scenery than to perpetuate the conditions now seen on the grounds.—Ed.]

In the Redwood Forest.

To the Editor of Garden and Forest:

Sir,—The larger part of my summer vacation has been spent camping in the Coast-range upon a tract of eighteen hundred acres north of Russian River, reached by the North Pacific Coast Railroad from San Francisco, a line that has opened up some of the most attractive districts in California. The eighteen hundred acres, mostly covered by forest, are the property of William Montgomery, a well-known capitalist, and has been kept with great care, so that it would be a pleasure to live there for months instead of for weeks. Redwood groves, famous throughout California, occupy the "flats" along Austin Creek, and lesser, but still remarkable, forests fill the branch cañon. Along the eastern side of the tract the Oak country begins; toward the ocean the Redwood is more mixed with Douglas Spruce, and the Tan-bark Oak (Quercus densiflora) attains a larger size.

The atmosphere is dry and clear at this season, and the best place to pitch a tent is often in the deepest recesses of the forest, where only glimpses of the sky can be obtained. I had long had an idea that the Redwood forests were too damp for comfortable camping, and it may be so near the ocean, where the fog rolls in, but on Austin Creek, at least, any person fit to live outside of a hospital could make himself comfortable at this season. An old sailor who lived in a small cabin in the vicinity told me, however, that it "did rain awful every winter." Late in the autumn, too, as I learn, the insect-life of the forest is very annoying. July and August are almost free from these pests if one does not camp in the Laurel-clumps, which are said to swarm with various abominations.

Besides the Redwoods, there are beautiful tall Maples by the

stream and a solitary Torreya Californica, the only one in the region. Immense bushes of Rhododendrons in full bloom fairly line the banks. The distant effect is of white masses against the dark Redwood, but upon a nearer view the delicate buff markings tinge the white. Watson's description of R. occidentale, the California Azalea, mentions the "pale yellow bands upon the white or slightly rosy flowers." I have sometimes seen plants to whose flowers pale yellow applied, but the generality are marked with a distinct buff of various shades, depending upon age of flower, location, or minor variations of the species. Watson (*California Botany*) gives the height of R. occidentale as from four to six feet, but on Austin Creek, at least, it seems hard to find plants of less than eight or ten feet in height.

Several miles below our camp the Redwood forest was cut by lumbermen twenty or thirty years ago, and it has since partially grown up. This region possesses a peculiar interest to me because, more than any other place I know of, it shows the kind of reforesting that might easily be had with a little care from capable officials. If the fire had been kept out of several hundred acres along Russian River and Austin Creek, its tributary, there would be a fine and well-distributed growth of Redwoods there, for few cattle and sheep are in the region. The lumbermen left many old decayed trees, which sheltered the stumps, so that nearly all sprouted, and the young Redwoods are now loaded with seed. Richer soil could hardly be obtained anywhere, and if the fires which have swept through here nearly every other year were prevented, the second growth would be valuable.

In this old lumberman's camp, wild Blackberries, Raspberries and Currants have taken possession of acres. But the most remarkable feature is the extent to which the common Bigroot, Megarrhiza Californica, has become a drapery for stumps and fast-dying Redwoods. It is the Ivy of every deserted Coast-range lumber-camp. Twenty, thirty, forty feet above the ground, its star-like flowers, prickly balls and pale green leaves trail downward. In luxuriance of growth it almost rivals the wild Grape. But it stays in the clearings; you may search the deep forest for miles without discovering a plant of Megarrhiza.

In the early days of lumbering here, the Redwood-trees were cut at a height of twelve or fifteen feet from the ground, the best part of the trees being wasted. Many such stumps still remain and are being worked out for the lumber. In one case on Russian River, a stump fifteen feet high and sixteen feet across yielded fifteen thousand feet of lumber which sold at $40 a thousand because it happened to be of especial beauty for cabinet-work. This stump was taken out by Colonel J. B. Armstrong, of Guerneville, who afterward told me the particulars. The labor of four men for three days was required to saw off the stump at the surface of the ground; then it was necessary to use eight yoke of oxen to drag the stump over. After splitting the log into four parts with powder, it was taken to the mill, and turned out, as I have said, fifteen thousand feet of "curly Redwood." If all the stumps paid like this, there would be work for many companies in the deserted lumber-camps, but it is easy to see that many are shattered, decayed or destroyed by fires. In cases where the lumber from the stumps is of no value, the cost of clearing bottom-land is from one hundred to four hundred dollars per acre. The fruit-growers along the Russian River usually spend from fifty to a hundred dollars "clearing brush," and plant their Prune and Peach orchards among the blackened stumps. Some of the finest fruit-trees I have ever seen were growing in this way. The soil is very deep and rich. No finer orchard-soil can be found anywhere.

Berkeley, Cal. *Charles Howard Shinn.*

Recent Publications.

The Foot-path Way. By Bradford Torrey. Houghton, Mifflin & Co.

The song of that light-hearted rogue, Autolycus, with whose peccadillos we are inclined to sympathize in spite of our Puritan inheritance, seems a little out of place upon the title-page of a volume which records the impressions and observations of a naturalist of the nineteenth century. For, in these days, we are nothing if not scientific—while the song from the Winter's Tale was written in the days before science was. Forever associated with the merry harvest-feasts of Bohemia, over which Perdita presided, it suggests that spontaneous delight in out-of-door life found now only in the child which has not yet borne the burden and heat of the day, or perhaps, in the tramp who evades them. But, since the paradise once lost may not be regained, and even our children's play-hours must have some touch of serious earnest, it may be that the passion of the scientist will prove no unworthy substitute for the glories that have passed away. We are not surprised, then, that a walk over the "Foot-path Way," under Mr. Torrey's guidance, is no dreamy saunter over highways and hedges, with heart and mind passive and inert, and the senses only half-responsive to the myriad enchantments with which nature would woo the wanderer from his petty cares; but rather a rough scramble over hill and dale, "through bush, through brier," with every sense alert and vigorous, and the mind as keenly alive to the quest of the moment as if the fortunes of a state depended upon the observations taken during a morning's walk. This volume, like its predecessors, by the same author, "Birds in the Bush," and "A Rambler's Lease," consists of a series of essays on out-of-door topics, most, if not all, of which were first published in the pages of the *Atlantic Monthly*. To Mr. Torrey, all objects in nature, whether animate or inanimate, have both charm and significance, and though his own interest centres chiefly in birds, his eye is trained to note the grace and beauty of every way-side flower, and his ear quick to catch in the solemn music of the Pines "some accents of the eternal language" which he would fain interpret, if only with faltering accents, to his fellow-men.

But Mr. Torrey's love for birds is more human than ornithological, and bespeaks the man rather than the scientist. He studies them as individuals rather than "en masse"; delights in their idiosyncrasies and depicts their little virtues, or, perhaps, their vices, in a fashion peculiarly his own. For this reason the pages in which he records the manners and customs of his feathered friends prove very pleasant reading even to those who do not share his enthusiasm in his favorite pursuit. The information he gives is interspersed with flashes of playful fancy and occasional touches of genuine humor which would give charm even to a duller subject, and we cannot but envy him his enjoyment. "A happy man," he tells us, "is the bird-lover—always another species to look for, another mystery to solve. His expectations may never be realized, but, no matter, it is the hope, and not the fulfillment, that makes life worth having. How can any New Englander imagine that he has exhausted the possibilities of existence so long as he has never seen the Lincoln finch or the Cape May warbler? But I speak 'as a fool.' Our happiness, if we are bird-lovers, indeed, waits not upon novelties and rarities. All such exceptional bits of private good fortune let the fates send or withhold as they will," and so, though he feels all the scientist's enthusiasm for the "novelties and rarities" that fly across his path, he finds a sober certainty of waking bliss in watching the daily and nightly habits of the birds that from time immemorial have haunted the abodes of men.

In the paper entitled "December Out-of-doors," he writes very pleasantly of the kill-deer plovers, the presence of which in great numbers made the winter of 1888–89 famous in the ornithological annals of New England, but even his interest in this rare "find" does not blind him to the delicate winter loveliness of the vines and mosses, nor make him forget to note the sixteen sorts of wild blossoms to which December sunshine had given courage to brave December storms. In "A Widow and Twins" we have one of the prettiest bits of observation ever recorded in the annals of a naturalist. The widow is a tiny humming-bird deserted apparently by her mate at the time when she is most in need of his protection, and Mr. Torrey enables us to watch with eager interest the tender care she bestows for eight long weeks upon her mites of nestlings, until, at last, the period of infancy safely passed, all three fly away to some brighter clime, to return once more perhaps when the Honeysuckle is again in bloom. In "Robin Roosts" we learn the rather startling fact that robins fly for miles at nightfall to roost with thousands of their mates in some grove which has been chosen for the season as the nightly trysting-place of all the clan. The paper which shows the most true poetic feeling is that written in praise of the White Pine, which, for some reason he does not give, Mr. Torrey chooses to call the Weymouth Pine. For the moment he is above science and the objects of science, and is only conscious of the beauty of the solitary Pine and the impressive solemnity of the Pine-forest, dark, spacious, slumberous, musical. The lowly Partridge-berry and the showy Lady's-slipper attract him, for they are always the Pine-tree's neighbors, and with them he would listen to the murmuring leaves, which give utterance to musings and feelings that lie too deep for words. But these moods pass: "We are always in the presence of natural beauty, but only on rare occasions are our eyes anointed to see it. Such ecstasies it seems are not for every day. Sometimes I fear they grow less frequent as we grow older. We will hope for better things; but should the gloomy prognostications fall true, we will but

betake ourselves the more assiduously to lesser pleasures—to warblers and Willows, Roses and Strawberries. Science will never fail us. If worse comes to worst, we will betake ourselves to the moths."

Notes.

It is estimated that the cemeteries of London cover an aggregate area of 2,000 acres, the value of which is not less than £2,000,000.

In the issue of *Gartenflora* for September 15th, it is noted that twenty-seven horticultural firms had thus far announced themselves to the Berlin committee as intending to exhibit at the World's Fair in Chicago.

Of the common shrubs that are valued for autumn color the Forsythias should not be forgotten. The deep chocolate color of the leaves just now is an admirable foil to the lighter and brighter tints of many species.

The most beautiful fruits in the market now are the Japanese persimmons. One variety, larger than a goose-egg, and with a smooth skin of a clear canary-yellow, seems to be as fair a product as any orchard ever yielded.

The product of some California orchards, as reported in a late letter to *The Tribune*, of this city, are somewhat astonishing. For example, a sixteen-acre orchard of German Prunes in Sonoma County, from five to eight years old, yielded 90,000 pounds of dried fruit this year and a net profit of $7,500.

Several of the annual horticultural and pomological exhibitions usually held during September in north Germany have been officially interdicted, on account of the fear of cholera. This is especially regretted at Breslau, where not only an exhibition but a pomological congress was to have been held.

Among the plants that are conspicuous for their beautiful fruit just now are Berberis Thunbergii, B. Sieboldii, B. Chinensis, B. Amurensis and the yellow-fruited form of B. vulgaris. The Prinos section of the Hollies are also at their very best, especially Ilex Sieboldii, and I. lævigata with its yellow form. Some of the species of Evonymus are making a beautiful display in the Arnold Arboretum, especially the variety Coccinea of E. Europeus and the rose-colored variety from Japan. The fruits of many shrubs are so beautiful and last so long in good form that Mr. Jackson Dawson writes to suggest that some one should plant an autumn garden of shrubs which are especially valuable for their foliage and fruit.

A writer in a recent number of a Belgian horticultural journal speaks of the "veritable invasion" of his region this year by insects of the genus Aphis. "It is enough to make one believe," he declares, "that each plant has a species of its own, even weeds being attacked. Young and mature turnips, artichokes, endives, leaves and fruits—everything is threatened with death by this multitude of tiny parasites. Potatoes are not spared, but it is to be remarked that those which were sprayed with Bordeaux mixture have remained intact. In the nurseries fruit-trees and other species have suffered to the point of denudation. Copious irrigation, while it does not destroy the insects, invigorates the plants and enables them better to resist their depredations. A machine seems to be needed which will spray small plants from beneath with poisonous mixtures, since the clever aphides keep mostly to the under sides of the leaves."

In 1868 the "Portland Catalogue" of plants native to the state of Maine was issued by Professor Goodale and the Reverend Joseph Blake, and since then no complete account of the flora of this state has been published. It will, therefore, be welcome news to local botanists that a second and enlarged edition of this catalogue has just been issued, especially as the original one has become very rare. The new edition has been prepared by Mr. Merritt L. Fernald, and is a reprint from the *Proceedings of the Portland Society of Natural History*. It is simply a list in which the distribution of the more common plants has been noted by means of symbols, but it contains more than four hundred and fifty species and varieties of flowering plants and vascular cryptogams in addition to those named in 1868, the whole number amounting to more than one thousand five hundred and fifty.

In reply to an inquiry from the Boston Metropolitan Park Commission for information concerning statutes relating to parks, the chairman of the Berlin Committee on Parks, Gardens and Tree Plantations replied that in Prussia special laws relating to the laying out of public parks and gardens have thus far been considered unnecessary, since every community has been alive to the desirability of such institutions, and, therefore, legislative compulsion has not been required. Travelers in Germany will bear testimony to the truth of this. In every city tasteful public gardens and parks will be found; choice landscape passages are carefully preserved and their beauty enhanced; and there are usually extensive public forests in the neighborhood, offering delightful recreation to the people, while the city draws profit from the timber and fuel cut there. May the time be hastened when our American communities will universally show their public spirit in the same enlightened manner.

Sub-irrigation has been tried in the greenhouses of the Ohio Experiment Station. Two beds, fifteen feet long and seven and a half feet wide, were floored with matched boards laid in white-lead so as to be water-tight, and the ends and sides were made water-tight. In the bottom of these benches three-inch tiles were laid two and a half feet apart, and arranged so that water could be supplied to each row as desired and six inches of soil were then placed on the benches covering the tiles out of sight. The effects of sub-irrigation upon the growth of Lettuce and Radishes were remarkable, and it was beneficial decidedly to Cucumbers. The first crop of Lettuce on the sub-irrigated beds was some thirty per cent. heavier than the crop on the bed treated in the ordinary manner, while the second crop showed a gain of fifty per cent. in favor of sub-irrigation. Radishes treated in this way came to marketable size earlier and were larger than those grown by the ordinary method. Nearly one-half of the sub-irrigated Radishes were ready to pull before one of the others could be used.

The colored frontispiece to the issue of *Gartenflora* for October 1st shows the portraits of two specimens of the Ontario apple, and is accompanied by a laudatory description written by Herr Carl Matieu, of Charlottenburg. The author says that this fruit, although described as early as 1885 in America, has not been hitherto noticed in Europe except by a single brief reference in a periodical published in 1888. On the 28th of April of this year, he says, he laid specimens of it before the Congress for the Promotion of Horticulture in the Prussian States. "The fruits were in the best condition, showing very slight, if any, signs of shrinkage, and yet had not been wintered in a cellar, but merely in a ground-story room with a northern exposure, laid on a layer of thick paper and shielded from the air only by two thicknesses of newspaper. They were cut from a tree trained on cords, four years old and about a metre in breadth, and from a pyramidally trained tree of the same age, and about a metre in height, and numbered in all twenty specimens." After explaining how easily this Apple may be grown in various ways, the writer adds that it is especially remarkable for its keeping qualities, for its delicious flavor and for the delicate substance of its flesh, which fits it admirably "for old people who have no longer any teeth which they can call their own."

At the forty-first meeting of the American Association for the Advancement of Science, held at Rochester, New York, in August last, Mr. L. M. Underwood spoke before the Botanical Club of "A Variety of Polypodium vulgare, new to America." "In the autumn of 1890," says the report of his words, published in the *Bulletin of the Torrey Botanical Club*, "my attention was called to a peculiar 'crispy' fern, growing on Mohawk Mountain, Connecticut, by Mrs. T. R. Waite, of New Haven, who had spent several summers on the summit of the mountain in the log-cabin established there for tourists. The plant proved to be a variety of Polypodium vulgare hitherto unknown in this country, but described from England as var. Cambricum. The plant is easily recognized by its deeply pinnatifid pinnæ, which are strongly in contrast with the normal entire pinnæ of typical forms of the species. This discovery is rendered more interesting by the announcement of the *State Botanist*, of New York, of a second European variety of this same species. Unlike var. cristatum, as figured by Peck and shown in the specimens kindly communicated by him, the specimens of var. Cambricum, as found on Mohawk Mountain in August, 1890, and again in July, 1891, were entirely sterile, not even showing rudimentary sori. The plants were growing on the sloping face of the granitic rock of which the mountain is composed, in small patches thoroughly entangled with plants of normal Polypodium vulgare. Environment is, therefore, not the cause of the variation in this instance, but it must be attributed rather to an inherent tendency to be something different. It is a question of interest to know just when to recognize a form of this kind as a true botanical variety."